

REMARKS

In the Office Action dated August 20, 2009, the Examiner rejects claim 4 under 35 U.S.C. § 112, second paragraph. The Examiner rejects claims 1-2, 5, 6-9 and 11-17 under 35 U.S.C. § 102(b) and rejects claims 3, 4 and 10 under 35 U.S.C. §103(a). With this Amendment, claims 1, 3, 4, 13-15 and 17 are amended. New claim 18 is added, and no claims are canceled. After entry of this Amendment, claims 1-18 are pending in the Application. Reconsideration of the Application as amended is respectfully requested in view of the arguments below.

Rejection under 35 U.S.C. §112, second paragraph

The Examiner rejects claim 4 under 35 U.S.C. § 112, second paragraph, as being indefinite due to the phrase “1017-1018.” Applicants have corrected this to recite $10^{17} - 10^{18}$ cm³ as shown in Fig. 8. Applicants respectfully submit that the rejection has been overcome, and the claim is now definite.

Rejections under 35 U.S.C. §102(b)

The Examiner rejects claims 1-2, 6-9, 13 and 15-17 under 35 U.S.C. § 102(b) as being anticipated by Horie et al. (US 2001/0019794). Claim 1 (and claims 2 and 6-9 by their dependency), claim 13, claim 14, claim 15 (and claim 16 by its dependency) and claim 17 each recites in part a bipolar battery cell that comprises a plurality of electric cells. Each electric cell comprises a bipolar electrode including a collector having a positive-electrode layer on one surface and a negative-electrode layer on another surface, an electrolyte layer that exchanges ions between the positive-electrode layer and the negative electrode layer and a discharge circuit provided within each electric cell that electrically balances charged conditions of adjacent bipolar electrodes.

The claims have been amended to more clearly define the invention. Support for the plurality of electric cells 150 is found in the specification in at least paragraphs [0042], [0048] and [0050] and FIG. 2. Support for adding that the discharge circuit electrically balances charged conditions of adjacent bipolar electrodes can be found in the specification in at least

paragraphs [0006], [0010], [0050], [0068]-[0070] and [0073]. Support for a discharge circuit being provided in each electric cell can be found in at least paragraph [0048]. Support for method claim 17 amendments can be found in the specification in at least paragraph [0061].

Horie et al. discloses an apparatus for sensing a state of a battery that can be installed into the battery without unnecessary wiring. (¶[0010], [0033]). The sensing device senses excessive discharge and /or excessive charge states of the battery. (¶[0078]). Horie et al. does not disclose a discharge circuit that electrically balances charged conditions of adjacent bipolar electrodes. Because Horie et al. fails to teach or suggest each and every element of each independent claim 1, 13-15 and 17, Horie et al. cannot anticipate the claims. According, claims 1, 13-15, 17 and their dependent claims 2, 6-9 and 16 are allowable over the cited reference.

The Examiner rejects claims 1, 5, 11, 12 and 14 under 35 U.S.C. § 102(b) as being anticipated by Hisamitsu et al. (US 2004/0038123). As noted above, claim 1 (and claims 5, 11 and 12 by their dependency) and claim 14 each recite in part a bipolar battery cell that comprises a plurality of electric cells. Each electric cell comprises a bipolar electrode including a collector having a positive-electrode layer on one surface and a negative-electrode layer on another surface, an electrolyte layer that exchanges ions between the positive-electrode layer and the negative electrode layer and a discharge circuit provided within each electric cell that electrically balances charged conditions of adjacent bipolar electrodes. Support for the amendments is noted above.

Hisamitsu et al. discloses a stack-type battery that is able to measure a voltage of each unit cell with measurement tabs without the measurement tabs touching and short circuiting. (¶[0008] and [0011]). Shared voltage measurement tab electrodes are connected to the current collectors to allow voltages of the unit cells to be measured. The different embodiments disclosed by Hisamitsu et al. provide different arrangements of the tabs in the stack, as seen in FIGS. 2, 6, 9 and 12. In the fourth embodiment, Hisamitsu et al. discloses an external controller unit CU1 for controlling unit cells. (¶[0115]). As shown in FIG. 13, the controller has sockets

that receive the measurement tab electrodes 10, 18. The controller is located outside of the bipolar battery as shown in FIG. 16 and described in paragraph [0122].

Hisamitsu et al. does not disclose a discharge circuit provided within each electric cell that electrically balances charged conditions of adjacent bipolar electrodes. The measurement tabs of Hisamitsu et al. must communicate with a controller outside of the battery to affect the voltage. Accordingly, Hisamitsu et al. does not anticipate the invention of independent claims 1 and 14 and their dependent claims 5, 11 and 12. Applicants respectfully submit that these claims are thus allowable over Hisamitsu et al.

Rejections under 35 U.S.C. §103(a)

The Examiner rejects claim 10 under 35 U.S.C. § 103(a) as being unpatentable over Horie et al. as applied to claim 9 in view of Hisamitsu et al. Claim 10 depends indirectly from claim 1 to include all of the limitations therein and to further recite that a sheathing material covers and seals the bipolar electrodes, the electrolyte layers, the discharge circuit, and the light sensor. As noted above, neither Horie et al. nor Hisamitsu et al. teach or suggest all of the limitations of claim 1. Horie et al. does not teach or suggest any circuit that can balance adjacent electrodes. Hisamitsu et al. does not disclose a discharge circuit provided within each electric cell that electrically balances charged conditions of adjacent bipolar electrodes. Hisamitsu et al. addresses the problem of short circuiting tabs by changing the placement of the tabs. The controller is formed with sockets to receive the tabs. Therefore, Hisamitsu et al. does not teach or suggest to one skilled in the art to move the tabs and the controller to between the electrodes. The invention of claim 1, and claim 10 by its dependency, is not rendered obvious by the cited combination.

The Examiner rejects claim 3 under 35 U.S.C. § 103(a) as being unpatentable over Horie et al. as applied to claim 1. Claim 3 depends from claim 1 to include all of the limitations therein and to further recite that the cell further comprises a contact area between the discharge circuit and an adjacent bipolar electrode that is more than 0.06 mm^2 per battery capacity of the

bipolar battery 1 Ah. As noted above, Horie et al. does not disclose a discharge circuit provided within each electric cell that electrically balances charged conditions of adjacent bipolar electrodes. Horie et al. discloses sensors. Therefore, Horie et al. cannot render obvious the invention of claim 1 and therefore claim 3 by its dependency. In addition, the Examiner states that although Horie et al. does not disclose the element of claim 3, it would be obvious to modify the variable of the circuit by modifying the contact area. However, Horie et al. does not perform the same function as Applicants' discharge circuit, and therefore, would not speak to the contact requirements of a circuit that it does not employ. Claim 3 is thus allowable for this reason in addition to being allowable based on its dependency from allowable claim 1.

The Examiner rejects claim 4 under 35 U.S.C. § 103(a) as being unpatentable over Hisamitsu et al. as applied to claim 1 in view of Einthoven et al. (US 2003/0205775). Claim 4 depends from claim 1 to include all of the limitations therein and to further recite that a threshold of a discharge voltage in the discharge circuit is set between 3.6 V – 4.1 V, and that a doping concentration is set between 10^{17} – 10^{18} cm⁻³, and the thickness of a depletion layer is set between 0.1 μm – 1.0 μm so as to set a breakdown voltage of a PN junction of the discharge circuit the same as to the threshold. As noted above, Hisamitsu et al. does not teach or suggest all of the limitations of claim 1; in particular, a discharge circuit provided within each electric cell that electrically balances charged conditions of adjacent bipolar electrodes. Einthoven et al. also does not teach the use of its voltage suppression devices for balancing the electrodes of a battery and provided within each electric cell of the battery. Therefore, the combination fails to render obvious the invention of claim 1, and therefore claim 4 by its dependency. Applicants respectfully submit that claim 4 is allowable over the cited references.

New claim

New claim 18 depends from claim 1 and adds the feature wherein the discharge circuit comprises an abnormal voltage detecting circuit and a voltage balancing circuit.

U.S. Pat. Appl. No. 10/573,462
Response to Office Action dated August 20, 2009
Dated: November 6, 2009

Page 10 of 10

Applicants respectfully submit that none of the cited references teach or suggest the combination of features claimed in new claim 18.

Conclusion

Applicants respectfully submit that this Amendment has antecedent basis in the Application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the Application. Reconsideration of the Application is requested. It is respectfully submitted that this Amendment places the Application in suitable condition for allowance; notice of which is requested.

If the Examiner feels that prosecution of the Application can be expedited by way of an Examiner's amendment, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,
YOUNG BASILE
HANLON & MACFARLANE, P.C.



Francine B. Nesti
Registration No. 53376
(248) 649-3333

3001 West Big Beaver Rd., Ste. 624
Troy, Michigan 48084-3107